CONFIDENTIAL

MEMORANDUM

To: [redacted] (4)
File (1)

Case: QK-15-529 C-59411 Date: February 15, 1955 Page: 1

25X1

Subject: Status Report No. 3-A

FILE: 24 Clockwork

1. Objective:
   a) To develop and complete specifications for a 24-Hour Clockwork Delay Mechanism, including movement, case and accessories, adapter and unit package.
   b) To perform a limited test program to determine the operating characteristics and limitations for the 21-Day J-Feder Clockwork Delay Mechanism.

2. Present Phase:
   a) 24-Hour Delay Mechanism
      1) Phase III, statistical evaluation of performance, continues with final data reduction.
      2) Design of the unit package and requests for packaging materials quotations continue.
      3) Interim Report No. 3, held for alteration as the result of additional information, is being prepared for transmittal.
      4) Phase IV, revision of drawings to keep them up to date, has been re-initiated. (See HFK's memos of February 9, 1955, forwarded herewith.)

Firing Device - Clockwork
14 Status Reports
Mar '53 - Feb '55

[redacted] Phase V, maximum usage tests, have been initiated. 25X1

   b) [redacted]eder Delay Mechanism
      1) All work has been halted on these mechanisms pending shipping instructions from the Client.
      2) Background data is being reviewed for a termination report on this phase of the project.

3. Progress:
   a) 24-Hour Delay Mechanism
      1) As the result of initial trip lever torque tests run, Interim Report No. 3, dealing with the causes of failure, has been revised.
      2) The production status at both New Haven Clock & Watch and Thomaston Special Tool Company has been reviewed in visits on February 4, 1955. (See HFK's memos of February 9, 1955, forwarded herewith.) 25X1

[redacted] has visited the Reservation to review the program. 25X1

A complete set of drawings has been transmitted to the Client.

HFK

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[redacted] 25X1

b) J-Feder Delay Mechanism

1) In accordance with [redacted] request, all work on these mechanisms has been terminated. 25X1

4. Future Work: To be completed within the next report period:

a) 24-Hour Delay Mechanism

1) Receipt of statistical evaluation and submission to the Client.

2) Rewrite and submit Interim Report No. 3.

3) Write and submit rough draft of 24-Hour Delay Operating Instructions.

4) Continue alterations to movement drawings.

5) Dependent on delivery of movements from New Haven, commence assembly of movements into the cases at Thomaston.

6) Incorporate review items from both New Haven and Thomaston into the Specifications.

b) J-Feder Delay Mechanism

1) Commence termination report (not to be completed within next report period).

[redacted] 25X1

/mpk

MEMORANDUM

CONFIDENTIAL

To: [redacted] (4)
III (1)
File (1)

Case: QK-15-529 Date: January 3, 1955 Page: 1

25X1

Subject: C-59411
Status Report No. 2-A

1. Objective:

a) To develop and complete specifications for a 24-Hour Clockwork Delay Mechanism, including movement, case and accessories, adapter and unit package.

b) To perform a limited test program to determine the operating characteristics and limitations for the 21-Day J-Feder Clockwork Delay Mechanism.

2. Present Phase:

a) 24-Hour Delay Mechanism

1) Phase III work, the statistical evaluation of mechanism performance, is being conducted.

2) Design of the unit package continues.

3) Interim Report No. 3, dealing with causes for malfunctioning during operation, is being reviewed and prepared for forwarding.

b) J-Feder Delay Mechanism

1) Running of the best of the J-Feder mechanisms continues, to obtain confirmation of previous calibration curves.

2) The Client is considering transfer of the J-Feder mechanisms to Pittman-Dunn Laboratory, Frankford Arsenal, for overhaul by the fuze repair section there.

3. Progress:

a) 24-Hour Delay Mechanism

1) The trip lever spring torque tester has been completed and initial tests have been run.

2) The temperature performance runs, using revised jigs for elapsed time measurement on electric clocks, have been completed and results have been submitted to statistical analysis section for evaluation.

3) Thomaston has advised ADL that they are ready to proceed with assembly of the remaining units at any time.

From: HFK

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4) New Haven has received the finished drums and minute hands from Canadian Radium & Uranium Co. and is currently assembling these items.

5) New Haven has completed their review of movement drawings; some details require alteration. These changes will be discussed with them during a visit to their plant within the next three (3) weeks.

6) Initial packaging sketches and plans have been made, but a wholly satisfactory package design has not yet been developed.

7) Interim Report No. 3 has been drafted, but awaits review before submission.

b) J-Feder Delay Mechanism

1) Additional runs to confirm previous calibration curves and establish an indication of reproducibility of each mechanism have been made.

2) One of the Client's project engineers and the writer have visited Frankford Arsenal to discuss both the possible reasons for the apparent failure of the FA #434 oil and possible transfer of the J-Feder mechanisms to the Arsenal's fuze and watch shop for overhaul.

3) The J-Feder instruction sheets have been completed and a sample has been forwarded to [redacted] 25X1

4. Future Work: To be completed within the next report period:

a) 24-Hour Delay Mechanism

1) Visit New Haven Clock & Watch Company to discuss drawing alterations and inspect assembly line.

2) Complete statistical analysis of time-temperature runs and submit to Client.

3) Submit Interim Report No. 3.

4) Make alterations to drawings, print three (3) complete sets for reference, submitting one (1) set to Client.

5) Dependent on delivery of movements from New Haven, commence assembly of movements and cases at Thomaston.

6) Incorporate review items into specifications(if Thomaston's review complete within this period).

b) J-Feder Delay Mechanism

1) Continue runs to confirm calibration curves.

2) Await Client decision on disposition of mechanisms before any new action is initiated.

25X1

/mpk

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MEMORANDUM

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To: [redacted] (4)
(1)
(1)
(1)

Case: 58214-AB Date: October 1, 1954 Page: 1
QK-15-529
Subject: Status Report No. 12

1. Objective:

a) To develop and complete specifications for a 24-Hour Clockwork Delay Mechanism, including movement, case and accessories, adapter and unit package.

b) To perform a limited test program to determine the operating characteristics and limitations for the 21-day J-Feder Clockwork Delay Mechanism.

2. Present Phase:

a) 24-Hour Delay Mechanism

1) Phase III work, the determination of mechanism performance at various temperatures from -45°F through +160°F, continues from the last report period.

2) Phase IV work, alteration of the drawings as a result of the sub-contractors' review, continues from the last report period.

ILLEGIB

3) An investigation is in progress to determine the minimum satisfactory torque settings for retaining screws, back-plate cap, shipping plug and trip lever.

4) Thomaston Special Tool Company is continuing its work to determine the requirements for a good paint bond on the steel front and back cover plates.

b) J-Feder Delay Mechanism

1) The test program to determine the upper and lower temperature range performance for some 30% of the J-Feder lot continues from the last report period.

2) The room temperature recalibration of those mechanisms showing erratic performance continues from the last report period.

3) Overhaul of the deranged mechanism continues, but without appreciable success.

4) The Client is processing the J-Feder instruction sheets.

From HFK

STAT

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3. Progress:

a) 24-Hour Delay Mechanism

1) Investigation of the minimum satisfactory torque settings to insure positive closure of the case and 100% operation of the trip lever has been initiated; initial results have been obtained and indicate that closure requirements should be quite easily attained in practice.

2) Interim Reports Nos. 1 and 2 have been submitted to the Client.

3) Procurement of both flat and O-Ring gaskets of Buna-N compounds has been initiated.

4) Procurement of Philips-head retaining screws and star-washers (for use under the front plate wire lugs) has been initiated.

5) Procurement of the refinished hour drums, hands and retaining nuts has been initiated.

6) No recommendations or comments have been received from New Haven Clock and Watch Company on the movement drawings submitted to them for review.

7) Thomaston has been advised of and is now investigating the recommendations for a good paint bonding to plated steel, as received from the Chemical Coatings Co., Rocky Hill, Connecticut.

8) Thomaston has completed manufacture of both the adapters and revised back plate caps.

9) The revised drawings for gaskets, positive starter and shipping plugs are approximately 50% complete.

b) J-Feder Delay Mechanism

1) The Client has approved the last revision of the J-Feder instruction sheet and has initiated printing operations.

2) The new mainsprings have been installed in the mechanisms requiring same, and recalibration is underway.

3) The lower operating limit for the J-Feder mechanism has been established at 0°F. Approximate rates for the initial lot have been established for this temperature.

4) The remaining lot, previously exhibiting erratic performance at room temperature, have been recalibrated in a horizontal position and are awaiting high-and-low limit testing. A portion of these mechanisms appear to be incapable of smooth performance, but will operate well within the limits of acceptability shown by the original German calibration sheets.

5) Approximately 14 of the mechanisms have been overhauled and appear to be incapable of continuous operation. No further work shall be done on these units; it is suggested that they be specially marked and used for training purposes only.

4. Future Work: To be accomplished within the next report period:

a) 24-Hour Delay Mechanism

1) Complete mechanism case and accessory drawing alterations.

2) Complete evaluation of minimum torque requirements and reduce the findings to practice for Thomaston's use in assembly of the cases.

3) Complete temperature-performance runs and initiate statistical evaluation of the data obtained.

4) Complete investigation of paint bond requirements, reduce to practice and incorporate findings into the specifications.

b) J-Feder Delay Mechanism

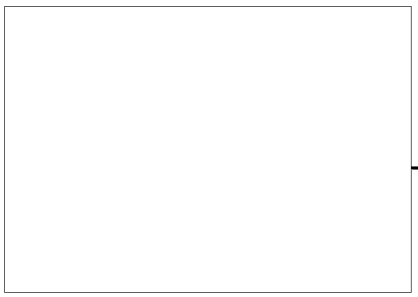
1) Complete temperature-performance runs for the lot to be expedited.

2) Initiate temperature-performance runs for the remaining mechanisms.

3) Reach a definite decision with the Client's project engineer as to the disposition of those mechanisms which do not perform or operate satisfactorily.

4) Set up and run initial unit packaging of mechanisms which have been fully evaluated (contingent on arrival of instruction sheets and satisfactory final evaluation of mechanisms).

STAT



/mpk

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MEMORANDUM

To: [redacted] (4) (1) (1) (1)

Case: 58214-BD Date: August 15, 1954 Page: 1

Subject: QK-15-556 Status Report No. 11

1. Objective: To produce, assemble, inspect and unit-package one thousand (1000) Bertha Mk 1-4a units in accordance with Specification No. T-219, and to recommend such alterations and redesign as may be shown necessary by this production.

2. Present Phase:
   a) Completion of final assembly and repair operations for those units found defective in appearance.
   b) Pre-assembly of packaging components in anticipation of final unit packaging.
   c) Analysis of faults found in the production lot, its assembly and testing techniques, and alteration of both drawings and specifications to eliminate these faults from future productions.
   d) Preparation of the final report for this production.

3. Progress:
   a) Thomaston Special Tool Company has completed production of the manufactured components.
   b) [redacted] has concurred in allowing a 29-unit shortag STAT to exist in the total number of units to be delivered; this is the result of an inadvertent error in the production of the body parts by Thomaston.
   c) The pre-assembly inspection of components has been completed.
   d) The 971 assemblies remaining in the order have been made, inspected and tested in accordance with the specifications.
   e) Pre-assembly of packaging components has been initiated.
   f) Alterations have been made to the component drawings as the result of experience gained during the production.
   g) [redacted] has requested that a single layer of aluminum foil be placed around the unit before it is wrapped with kempak and inserted into the packaging tube. STAT

4. Future Work:
   a) Completion of all assembly and repair operations for the next report period. (Approximately to October 1, 1954)

Told Flotch to ship us down 21 units unpackaged & to Package 950.

From HPK

FORM NO. 101 Arthur D. Little, Inc.

b) Completion of packaging operations. (During next report period.)

c) Completion of rough draft final report for the production. (During next report period.)

STAT

/mpk

STAT

MEMORANDUM

To: [redacted] (4) (1) (1) (1)

Case: 59214-AB Date: June 15, 1954 Page: 1

Subject: [illegible]-15-529 Status Report No. 10

STAT

1. Objective:

a) To develop and complete specifications for a 24-hour clockwork delay mechanism, including movement, case and accessories, adapter and the unit packaging.

b) To perform a limited test program to determine the operating characteristics and limitations of the 21-day J-Feder clockwork delay mechanism.

2. Present Phase:

a) 24-Hour Delay Mechanism

1) The low temperature tests of FS 434 and "Convalube 40" oils are in progress, with the objective of determining the temperature at which either one or both lubricants become unsuitable for movement lubrication.

2) The testing of gasket materials in common solvents is in progress, with the objective of determining whether or not one of the several materials under consideration is distinctly superior to the others for the proposed application.

3) Drawings and specifications for the movement and case are in progress.

b) J-Feder Delay Mechanism

1) 21-day timing and rate-setting runs in the horizontal position are continuing.

2) Overhaul and repair of the broken and deranged mechanisms has been initiated (see later notes under "Progress").

3. Progress:

a) 24-Hour Delay Mechanism

1) A source of Thiokol solid sheet stock has been located and samples of three (3) grades of that material are being procured and stamped into plate gaskets for testing.

2) The lubrication of low-temperature test movements has been completed after a complete overhaul to bring them again to an acceptable standard performance for test. Testing of the lubricants from -40° F. has been restarted.

From: [illegible]

STAT

FORM 101

3) A new, low-temperature watch lubricant, manufactured for test by the armed forces by Elgin National Watch Company, has been investigated and a sample is to be procured in July. This oil is claimed to satisfactorily lubricate watch movements at temperatures below -100° F.

4) Samples of the AB adapter have been received from Thomaston Special Tool Company, and difficulty has been experienced in tolerance control of the 7/16" - 20 case thread. Until a satisfactory control over this thread is established, no delivery of the adapters shall be accepted. A sample has been submitted to the Client.

5) A new cocking device has been received from Thomaston, and a sample has been submitted to the Client. (Refer to letter of May 27, 1954, C-58214-AB (WK-15-529), by E. F. Knight, Jr.)

b) J-Feder Relay Mechanism

1) Two (2) sources have been contacted and asked to quote on the manufacture of mainsprings to replace those broken in the J-Feder tests. It is planned to procure 20 each of these springs, allowing replacement of those already broken, and provide a reserve for those which may be broken in later testing and for the Client's supply against the same failure.

2) Performance testing and rate-setting of the J-Feder mechanisms in the horizontal position has progressed through several partial runs to establish the individual mechanism rates. The performances established are surprisingly good. This appears to be the result of two factors, namely: a) the long "run-in" period that has been conducted prior to the re-test now in progress, and b) the solvent action of the FA 434 oil has removed the last traces of varnish and gum from most of the movements.

3) Those movements previously found to stop during a run have been stripped, and their bearings, particularly the balance jewels, have been cleaned by mechanical means in addition to solvents. This treatment has eliminated malfunctions in a large number of cases.

4) An operating procedure for the packaging of the J-Feder mechanisms in nitrogen has been developed and techniques continue in test. Packaging materials have been ordered and are on hand.

5) A correction sheet for inherent rate errors of the movements has been drawn up and submitted to [redacted] for comment. STAT

6) The sketches for the proposed instruction sheet have been revised and completed and are herewith forwarded.

4. Future Work: a) 24-Hour Delay Mechanism

1) Complete Phase I work, including:

(a) Low-temperature evaluation of PA 434 and "Convalube A" oils (July 10, 1954)

(b) Comparison of various gasket materials in common solvents and water (July 30, 1954)

(c) Initial movement drawings and rough draft specifications (July 20, 1954)

(d) When received, the Elgin oil sample will be tested at low temperatures in the AB mechanism as a lubricant for special applications only, in range of low temperatures where present lubricants are believed to be unsatisfactory.

b) J-Feder Delay Mechanism

1) Complete Phase I work, including:

(a) Horizontal position rate-setting and performance testing at room, high and low temperature limits (September 1, 1954)

(b) Repair and replacement of broken parts (no estimate of time until return of quotations)

(c) Compilation of correction sheets for each movement, contingent on acceptance of the proposed instruction sheet (September 15, 1954)

5. Note: A starting date of June 1st has been selected for calculation of all target dates for the phases mentioned in the proposal for this case.

STAT

/mpk

7 10

MEMORANDUM

To: [redacted] STAT

Case: 86214-48 Date: April 30, 1954 Page: 1
CK-15-529
Subject: Status Report No. 9

1. Objective:
   a) To develop and complete specifications for a 24-hour clockwork delay mechanism, including movement, case and accessories, adapter and the unit-packaging.
   b) To perform a limited test program to determine the operating characteristics and limitations of the J-Feder delay mechanism.

2. Present Phase:
   a) 24-Hour Delay Mechanism
      1) The testing of the 24-hour delay mechanism remains substantially as reported in Status Report No. 8.
      2) The preparation of specifications and drawings for the watch movement has been initiated.
   b) J-Feder Delay Mechanism
      1) The operating tests of the J-Feder mechanism have been altered by the Client's direction to be conducted in the horizontal position; the rate-setting in this position has been initiated except for some 4 mechanisms having broken main springs.
   c) General Note
      1) It was stated that the test program for the 24-hour delay mechanism is substantially as reported by Status Report No. 8. During the period following that report it became apparent that additional funds were required to finish the program, and a request for funds was submitted on March 26, 1954. At the same time the work and commitments for this case were cut to a minimum to prevent incurring a substantial deficit. A change in administrative policy followed this reduction of effort, and the authorization for further funds has been withheld pending approval of a new program proposal. The additional delay caused by this change in policy required that all expenditures and work be suspended. This action was approved by the Client in a letter of April 22, 1954, to Mr. E. F. Kreidl.

3. Progress:
   a) 24-Hour Delay Mechanism
      1) The low-temperature lubrication elimination tests have been run to -40°F., but no significant difference has been determined at this temperature between P.A. 434 and Myvolube "A" oils.

From RFK

[redacted] STAT

FORM NO. 101

2) The lubrication of movements with F.A. #434, if shown to be necessary, has been investigated and an alternative method of handling the 900-odd movements remaining at New Haven Clock & Watch Co. has been determined. This method reduces the subcontract cost from $4.25 to approximately $1.50 per unit. Re-striping of the escape wheel has been investigated and can be done at the reservation.

3) The lubrication of watch movements with "Molykote" or similar MoS_2 lubricants-in-solvent has been abandoned because of the lack of a suitable technique to introduce it successfully into the mechanism.

4) Thomaston Special Tool Company is continuing the production of the re-designed cocking plugs and the adapters for the 100 test mechanisms now on hand, although no delivery has yet been made.

5) Redesign of the safety spindle and gland nut has been considered but proved to be such that it cannot be altered from its present configuration enough to provide for simpler assembly methods.

6) A photocopy of the report INVESTIGATION OF DETERIORATION IN CLOCKWORK DELAY MECHANISMS DURING STORAGE mentioned in Status Report No. 8 has been forwarded to the Client for his perusal and information.

7) There has been an extended visit to the reservation by [redacted] STAT to discuss the history and details of the project.

8) A proposal has been submitted to the Client covering the entire program for the 24-hour mechanism from testing through unit packaging and the final report.

b) J-Feder Delay Mechanism

1) Performance testing in the horizontal operating position has been initiated but not completed.

2) The unit-package for the J-Feder and its accessories has been developed and approved by the Client; the materials for this program are on hand, and all

techniques but one have been reduced to practice. It yet remains to determine the time required to purge the unit-pack can to insure a high nitrogen gas content prior to sealing.

3) It has been suggested, and the Client's project engineer has verbally concurred, that all J-Feder movements be packaged with an individual calibration sheet rather than instructions on expected rates obtained from a statistical evaluation of the test lot.

4) A proposal has been submitted to the Client covering the entire program for the J-Feder from testing through unit package and final report.

4. Future Work: The future work for the project is outlined in detail by the proposal dated April 30, 1954, submitted to the Client for the continuation of research and development in this case. Until approval of the program and the necessary authorization to recommence operations is given, it is not practical to estimate the dates of completion of any of the phases beyond those dates cited in the proposal.

STAT

/mpk

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MEMORANDUM

STAT

To: (4) (1) (2)

Case: 58214-AB Date: March 15, 1954 Page: 1
CK-15-529

Subject: Status Report No. 8

1. Objective:

a) To develop and complete specifications for a 24-hour clockwork delay mechanism, including movement, case and accessories, adapter and unit packaging.

b) To perform a limited test program to determine the operating characteristics and limitations of the J-Feder 21-day clockwork delay mechanism.

2. Present Phase:

a) 24-Hour Delay Mechanism

1) The 89 assemblies originally received from Thomaston Special Tool Co., Thomaston, Conn., are continuing under test, as outlined in the December 4, 1953, memorandum, "Outline for 24-Hour Test Program" and its references. The testing of the various lubricants at low temperatures is now in progress.

2) Methods of successfully lubricating a watch movement with a molybdenum disulfide-in-solvent suspension are now being investigated.

3) Methods of closure and gasket materials are now being tested at the equivalent of 100 foot water depths (50 psig) to determine the physical strengths and vapor transmission properties of the materials.

4) Drawings and operating requirements of the assembly are being incorporated into the rough specifications for initial review by both the Client and the several subcontractors. It is to be noted that these specifications, in their rough form, will not necessarily include factual data in many cases, but will, rather, attempt to indicate the methods and tests that are necessary and are critical to the testing of the assembly.

5) The case design, particularly the back plate and its attached parts, are being critically re-evaluated in an attempt to provide for easier and less expensive assembly of the mechanism.

6) The adapters for 100 mechanism assemblies are being manufactured by Thomaston Special Tool Co.

From HFK

FORM NO. 101

STAT

7) The revised cocking devices, to provide a self-locking feature in the cocking cap, are being manufactured by Thomaston Special Tool Co., at no extra cost to the Client.

8) A discussion is in progress with New Haven Watch and Clock Co., New Haven, Conn., to attempt to reduce the amount of work and cost involved in the relubrication of the 900 movements remaining in the initial order. Their original quotation for this work, which included disassembly, washing, reassembly, re-striping of the radium paint stripe on the escape wheel, and retiming of the mechanism, was $4.25 per unit.

9) Two (2) sample hands, blackened and radium-tipped, have been received from the New Haven Watch and Clock Co., and are being submitted herewith for the Client's information. The writer has approved these hands for production.

b) J-Feder 21-Day Delay Mechanism

1) The original 24-unit sample, now reduced to 20 units by reason of spring failures, continues in test.

2) The beat-timing of the remaining units, in the face-down position as recently requested by Mr. DanBrunt, is now in progress.

3) Packaging materials are being assembled for the prototype packaging of the mechanism and its accessories.

3. Progress: a) 24-Hour Delay Mechanism

1) The "as received" and "adjusted" tests of the original 89 mechanisms have been completed and are now being evaluated.

2) Various functional failures of the original 89 mechanisms have been investigated and eliminated by various methods. The greatest majority of these difficulties lay in the trip and release linkages; their elimination was accomplished by increasing

the trip lever spring tension far beyond the original specifications and by lubrication with molybdenum disulfide of the striker and striker spring. No failure was attributed to faulty design or manufacture.

3) A tentative timing procedure, yielding 24-hour running time errors which are within the desired range and of the "slow" type, has been established and is now being evaluated. This procedure calls for beat timing to a zero movement error after 5 to 6 hours' initial running time.

4) Thomaston Special Tool Co. reports favorable results, although no factual data as yet, in their attempt to obtain a better paint coat adhesion to the front and back plates. This increased adhesion has been accomplished by the use of a baking type, rather than air-drying type, of paint.

5) The 24-hour test program has been reviewed by both [redacted] and the writer, and the procedures outlined continue valid at this time. STAT

6) An estimate for the funds required to complete the entire program has been made and submitted for the Client's approval.

7) The report of Armour Research Foundation Project No. C-031-2, NOrd Contract 12347, INVESTIGATION OF DETERIORATION OF CLOCKWORK DELAY MECHANISMS DURING STORAGE, (AD 10313) has been received in microfilm form, evaluated, and a summary of the report, as it applies to the present project, is submitted for the Client's comment and general information as of this date. A printed copy of this report is being obtained as a permanent addition to the case files.

8) The report of the Quality Evaluation Laboratory, U. S. Navy Mine Depot, Yorktown, Va., Report No. QE/Y 53-13, EVALUATION OF CLOCK MECHANISM CD-12 Mod 0 w/CA-23 has been received and evaluated. It is the writer's opinion that this report can contribute little to the present case.

9) A satisfactory obscuring mixture for the coating of the plexiglass face of the assembly has been developed and tested. The report of results is submitted to the Client as of this date.

b) J-Feder 21-Day Delay Mechanism

1) The J-Feder test program has been reviewed by both [redacted] and the writer and, since the program, as originally outlined, can no longer provide useful advanced testing information to the 24-hour test program, it was reduced in scope by the elimination of the cycling, sequencing and plunge requirements. The statistical results of the face-down timing of all test mechanisms and the timing of the remaining mechanisms continues valid. STAT

2) The remaining mechanisms are now being timed and tested in the face-down position, as requested by [redacted]. STAT

3) The mechanised canning machine received at the reservation on 10 March is being set up and a chuck manufactured to handle the cans for the J-Feder package.

4. Future Work: a) 24-Hour Delay Mechanism

1) Submit report evaluating various gasketing materials for use under water and in various fuels and solvents. (Thomaston Special Tool Co. has not yet submitted the Thiokol and Buna-N gaskets requested by letter on January 13, 1954. As a result of this delay, the target date of this item remains as before, 1 month after receipt of all samples.)

2) Submit rough draft and drawings of the movement, case and accessory specifications. (1 April, 1954)

3) Design packaging prototype and submit report. (1 April, 1954)

4) Produce prototype of package and submit. (The canning machine originally intended for this purpose has been recalled by the Client on two occasions.

The new canning machine, received from Hunter Mfg. Co., is now being set up and will require a special chuck, in addition to the time delay for obtaining test cans. As a result of these delays, the target date for this item is being advanced to 30 April, 1954.)

5) Procure remaining adapters from Thomaston Special Tool Co. (15 April, 1954)

6) Complete 24-Hour Test Program and report. (15 April, 1954)

b) J-Feder 21-Day Delay Mechanism

1) Complete timing and evaluation tests, write report and submit for client's review. (This program has been altered to include all testing in the face-down position, as per [redacted]'s request of 3 March, 1954. As a result of this change, the target date for this item is being advanced to 30 April, 1954) STAT

2) Complete design drawings of the packaging prototype and submit for the Client's approval. (NOTE: [redacted] has seen and approved the initial sketches for this package, and the Client's representative has been consulted regarding the handling aspects of the problem.) (15 April, 1954) STAT

3) Complete a package prototype and submit for the Client's approval. (The same comment applies to this item as to the 24-hour packaging item as regards the canning machine difficulties. As a result, this item is being advanced to 30 April, 1954.)

/mpk

[redacted] STAT

MEMORANDUM

To: [redacted] (4) (1) (2)

Case: 58214-AB QK-15-529 Date: February 10, 1954 Page: 1

Subject: Status Report No. 7

STAT

1. Objective:

a) To develop and complete specifications for a 24-hour clockwork delay mechanism, including movement, case and accessories, adapter and unit packaging.

b) To perform a limited test program to determine the operating characteristics and limitations of the J-Feder 21-day clockwork delay mechanism.

2. Present Phase

a) 24-Hour Delay Mechanism

1) The 89 assemblies received from Thomaston Special Tool Co. are being relubricated with FA #434 oil as the result of the findings of the low-temperature J-Feder and spring performance tests.

2) Gasket materials and threaded joint sealing methods are being tested for resistance to water vapor transmission, pressure and vacuum deformation and solvent attack.

3) Drawings and operating requirements are being reviewed in preparation for specification writing and transcription of drawings to the client's paper.

4) Packaging and preservation methods and materials, including vapor phase inhibitors, are being investigated and reviewed in preparation for prototype packaging.

b) J-Feder Mechanism

1) 24 sample movements are being resubmitted to performance testing after having been relubricated with FA #434 oil to attain satisfactory operation in the vicinity of -65 Deg. F.

2) Packaging and preservation methods and materials are being collected and reviewed in preparation for prototype packaging.

3. Progress:

a) 24-Hour Delay Mechanism

1) 89 assemblies have been received from Thomaston Special Tool Co.

From HFK

[redacted]

STAT

FORM NO. 101

2) Thomaston has been authorized to commence production of the revised cocking device, to incorporate the locking feature reported in HFK's memo of 14 January, 1954.

3) Thomaston has been instructed to obtain front and back plate gaskets in sample lots of Buna-N and Thiokol materials. Thomaston has submitted an alternative gasket material of neoprene and asbestos fibre for evaluation. The specifications for these materials are available.

4) Thomaston has submitted six (6) samples of adapters for inspection and test. One adapter has been field-tested with an M-34 detonator, and all others were mated with their respective parts to determine correctness of sizes. The adapter thread mating with the M-34 detonator has been shortened by 1/64" to allow full gasket seating. Thomaston has been authorized to commence full production of the revised adapter.

5) Thomaston has been instructed to initiate an investigation to obtain better paint adhesion on the front and back plates of the mechanism case.

6) New Haven Clock and Watch Co. has been authorized to procure 1,000 additional hands, as reported in HFK's memo of January 14, 1954.

7) New Haven has been authorized to strip and refinish with a non-reflective black lacquer the 1,000 hour drums now on hand. An estimate for this work has been received.

8) As a result of the promising results obtained by the use of FA #434 oil in the low-temperature tests, New Haven has been authorized to wash and relubricate the remaining 900 movements with the #434 oil to be supplied by ADL.

9) Relubrication of the 89 movements as per the 24-hour mechanism test agenda has been completed and the performance testing initiated.

10) A meeting was held at the Reservation with Messrs. [redacted] of New Haven to discuss the technical aspects of the movement specifications and test program. Several additional meetings have been tentatively scheduled. STAT

11) The low-temperature performance of the Sandvik and New Haven springs has been evaluated and reported.

12) The [redacted] report has been transmitted to New Haven and its contents discussed at length with Messrs. [redacted] STAT STAT

13) Specifications for the 24-hour mechanism lubricants have been obtained and submitted to the client.

b) <u>J-Feder Mechanism</u>

1) Drawings for the tentative operating instruction sheet have been completed and submitted to the client.

2) General information drawings for a proposed waterproofing method for the J-Feder have been made and submitted to the client.

3) 24 sample movements have been overhauled and re-lubricated with FA #434 oil to attain low-temperature operation in the vicinity of -65 Deg. F (previous limit was -15 Deg. F) and are currently in test at 77 Deg. F. This has delayed the test program.

4) The required coupling bases have been received from the client.

5) The J-Feder adapters have been received from Ober Tool and Die Co.

6) A satisfactory source of special cans has been located, a quotation obtained, and the client's approval obtained to immediately initiate prototype canning of the J-Feder and accessories.

7) The hand canning machine has been received at the Reservation and is now being installed for use.

8) Materials and containers are being gathered for use in obscuring the plexiglass face to prevent detection of time delay setting.

4. Future Work: a) 24-Hour Delay Mechanism

1) Submit report evaluating various gasket materials for use in case gaskets (1 month after receipt of all samples).

2) Continue packaging prototypes and submit preliminary report and sample (April 1, 1954).

3) Submit rough draft of movement, case and accessory specifications (April 1, 1954).

4) Procure remaining adapters from Thomaston (delay as result of late delivery of thread gages to Thomaston) (April 15, 1954).

5) Submit samples and report of paint and container for plexiglass covering (March 15, 1954).

6) Completion of 24-hour test program (April 15, 1954).

b) J-Feder Mechanism

1) Complete test program and submit report evaluating the results (delay as result of relubricating of the 24 movement samples and complete re-initiation of tests). (March 15, 1954)

2) Complete packaging prototype and evaluate, submitting sample and report (March 15, 1954) (delay as result of canning machine being lost for 1-1/2 months).

/mpk

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MEMORANDUM

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To: (4) (1) (2)

Case: 53214-AB Date: December 8, 1953 Page: 1
QX-15-529
Subject: Status Report No. 6

1. Objective:

a) To develop and complete specifications for a 24-hour clockwork delay mechanism, including movement, case and accessories, adapter and unit package.

b) To perform a limited test program to determine the operating characteristics and limitations of the J-Feder 21-day clockwork delay mechanism.

2. Present Phase:

a) 24-Hour Mechanism

1) Assembly of 100 mechanisms and accessories by Thomaston Special Tool Company.

2) Instrumentation and jig preparation for lubrication, timing, usage, and storage testing.

3) Testing of flat and Sandvik spring performance at low temperatures.

4) Drawing review and parts inspections in preparation for specifications and transcription of drawings to client's paper.

b) J-Feder Mechanism

1) Testing of mechanisms under various temperatures.

2) Revision of J-Feder operating instructions to include illustrative art work.

3. Progress:

a) 24-Hour Mechanisms

1) New Haven Clock and Watch Co. has repaired and returned to Thomaston the 125 movements originally found to be defective. Movements are now being installed in cases at Thomaston.

2) Thomaston has developed a positive starter superior to any yet considered, and this design has been approved for production by the client.

3) The 24-hour test program has been reduced to writing and submitted to the client for approval.

4) The 24-hour adapter and case accessories have been completed by Thomaston for delivery with assemblies on or about December 15, 1953.

From/pdw HFK:pdw

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5) An investigation of performance of the Sandvik and flat springs under low temperature conditions has been initiated.

6) A progress report has been submitted covering the details of progress to December 1, 1953. This included the report on the two movements to Thomaston and the Sandvik spring.

7) A meeting has been held at the Reservation between [redacted] STAT STAT

8) Review of drawings and tolerance requirements for both the movement and case has been initiated.

b) J-Feder Mechanism

1) The test program has been re-initiated after difficulties experienced in evaluation of data.

2) A detailed report has been written describing the "promising packaging method" of waterproofing the J-Feder movement for wet-uses.

3) A detailed set of operating instructions has been written and a rough copy submitted to the client for information and comment. The illustrative art work for the instruction sheet is being prepared.

4) The proposed method of sealing the J-Feder box with polyethylene tape has been tested and found to offer a very poor vapor barrier against high temperature-high humidity conditions.

5) An interim report has been submitted covering details of progress to December 1, 1953. This included a detailed report of the packaging test.

6) Development of a new adapter, to accomodate the coupling adapter, has been initiated. A method of packaging the J-Feder movement and accessories in cans has been discussed and is being initiated.

4. Future Work: a) 24-Hour Mechanism

1) Receive 100 24-hour assemblies from Thomaston for test (December 18, 1953).

2) Initiate 24-hour mechanism tests (December 21, 1953).

3) Initiate formal specification writing (Jan 15, 1954), for completion of first rough draft by (April 1, 1954).

4) Complete testing and report evaluation of test data on low-temperature performance of Sandvik and flat springs (January 1, 1954).

5) Obtain engineering specifications on lubricants to be tested in 24-hour program (January 1, 1954).

6) Obtain engineering specifications on Thiokol and coroprene (January 1, 1954) and make comparative tests of both materials in solvents for gasketing information (one month after receipt of samples).

7) Investigate masking materials and test for effectiveness in obscuring the plastic face plate (February 1, 1954).

8) Submit [redacted] report to New Haven Clock and Watch Co. for information (December 20, 1953). STAT

9) Initiate unit packaging program, submitting preliminary report and sample by (April 1, 1954).

b) J-Feder Mechanism

1) Complete test program and evaluate in report form by (January 30, 1954).

2) Produce prototype of aluminum adapter (Dec. 15, 1954) and test for evaluation report (one month after receipt of coupling adapters from client).

3) Submit art work proposals for instruction sheet (January 1, 1954).

4) Initiate unit packaging program with commercial can, submitting sample and preliminary report (one month after receipt of hand operated canning machine from the client).

5. For detailed report of items reported above, see [redacted] interim report dated December 3, 1953. STAT

/pdw [redacted] STAT

MEMORANDUM

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To: [redacted] (4) (1) (2)

Case: 58214-AB Date: October 30, 1953 Page: STAT

Subject: GK-15-529 Status Report No. 5

1. Objective:
   a) To develop and complete specifications for a 24-hour clock-work delay mechanism, including movement, case and accessories, adapter and unit pack.
   b) To perform a limited test program to determine operating characteristics and limitations of the J-feder mechanism.

2. Present Phase:
   a) Assembly of 100 24-hour delay mechanisms.
   b) Development of extensive testing program for the 24-hour delay mechanism.
   c) Testing of J-feder mechanisms; evaluation of test procedures for use in extensive 24-hour mechanism tests.

3. Progress:
   a) New Haven Clock and Watch has delivered 100 movements to Thomaston for assembly in cases.
   b) Thomaston has completed work on developing dies for a simple positive starter designed after the L and N model.
   c) The Sandvik curved-section spring has been evaluated as contributing little to the 24-hour movement as regards torque improvement.
   d) J-feder tests have been instrumented and begun. Special attention is being given to projecting test techniques learned here to the coming tests on the 24-hour mechanism.
   e) Waterproofing of the J-feder has been abandoned, although one (1) promising method has been devised.

4. Future Work:
   a) Complete J-feder tests, evaluate, and put into report form (November 30, 1953).
   b) Procure J-feder adapters and shipping plugs, revise packaging to accomodate both (January 15, 1954).
   c) Develop and submit for Client's approval the extensive 24-hour test program (November 15, 1953).
   d) Instrument and gain preliminary experience for test of 24-hour mechanism (December 1, 1953).
   e) Obtain delivery of 100 24-hour mechanisms and components (November 20, 1953).

From HFK [redacted] STAT

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4. Future Work: f) Commence packaging program for 24-hour mechanism, using sealed cans and handsealers supplied by the Client (January 15, 1954).

/mpk

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MEMORANDUM

To: [redacted] (4) (1) (1)

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Case: 58214-AB Date: September 4, 1953 Page: 1

OK-15-529

Subject: Status Report No. 4

1. Objective: To develop and complete specifications for a clockwork, twenty-four mechanism, including movement, case, adapter, and unit pack.

2. Present Phase:
   a) Engineering development of positive starter.
   b) Final evaluation of special curved section spring.
   c) Final changes of movements.
   d) Investigation of possible methods for making J-Feder case watertight.
   e) Investigation of repackaging of J-Feder.

3. Progress: Two prototypes have been delivered from Thomaston Special Tool Co. for the client's approval; with but small changes these movements should be entirely satisfactory. Sample adapters have been submitted to the client for both the clockwork and the J-Feder. It has been decided that the Leeds & Northrup's positive starter will be used subject to redesign for mass production. Authorization for full production on both sine cases and watch movements has been given to Thomaston and New Haven Clock and Watch respectively. A test agenda for the J-Feder movement has been made up and accepted by the client. New Haven Clock has been instructed to produce twenty bare movements, ten having plain main springs and ten having the curved section main spring for relative evaluation. New Haven Clock has also been instructed to deliver the first one hundred movements to Thomaston without lubrication in anticipation of lubrication tests. Investigation of the American Time Products Company's "Watchmaster Timer" has been made and the decision has been made to purchase one for both the J-Feder and clockwork tests.

4. Future Work:
   a) Instrumentation of J-Feder tests (October 1, 1953).
   b) Completion of waterproofing investigation on J-Feder cases (October 1, 1953).
   c) Final development of automatic starter (October 15, 1953).
   d) Production of first one hundred watch movements (September 15, 1953).
   e) Completion of first one hundred cases (December 1, 1953).
   f) Development of test agenda for clockwork, case, and movement (December 1, 1953).

/pdw

From [redacted]

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MEMORANDUM CONFIDENTIAL MD 24 STAT

To: (4) (1) (2) Case: 58214-AB QK-15-529 Date: June 24, 1953 Page: 1 STAT

Subject: Status Report No. 3

1. Objective: To develop and complete specifications for a clockwork, 24-hour mechanism, including movement, case, adapter, and unit pack.

2. Present Phase:
   a) Assembly of two models.
   b) Tooling for watch movement.
   c) Evaluation of case.
   d) Preparation of sample adapter and cocking device.
   e) Design and model preparation of J-Feder adapter.

3. Progress: The two models have been delivered to Thomaston Special Tool Company by New Haven Clock and Watch Company. The two model cases are available but in ten days two cases from the production dies will be available. One sample will be zinc and the other aluminum. Evaluation will be made and a decision for production given. A sample adapter has been received and is being checked for proper thread size and pitch. A sample cocking device is also being prepared. Drawings of the case and adapter have been completed by Thomaston. Sample springs from the designated steel has been received by New Haven and will be installed in some units for comparative testing.

4. Future Work: Schedule is as follows:

   a) Review of prototypes - July 20, 1953
   b) Test agenda - July 15, 1953
   c) Evaluation of automatic starters - July 8, 1953
   d) Evaluation of adapter and cocking device July 8, 1953
   e) Production of 100 units - Sept. 1, 1953
   f) Evaluation of J.-Feder adapter - July 15, 1953
   g) Procurement of 110 J-Feder adapters - Aug. 15, 1953

/pdw

From STAT

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FORM NO. 101

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MEMORANDUM

CONFIDENTIAL

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To: [redacted] (4)
c (1)
(1)

Case: 58214-AB Date: March 26, 1953 Page: 1
QK-15-529
Subject: Status Report

STAT

MD 24 Firing Device, Clockwork
(Clockwork)

1. Object: The object of this work order is to develop a suitable clock work firing device that will operate in the desired manner between -40°F and 165°F.

2. Present Phase: The development of tooling and the production of 1,000 units for evaluation.

3. Progress: Thomaston Special Tool Company is approximately two-thirds complete on the tooling of the case. New Haven Clock and Watch Company has submitted a cost estimate in the amount of $15.64/unit based on a semi-production lot of 1,100 pieces. The purchase order for this has been submitted to New Haven Clock and Watch. Cost estimates have been received from Thomaston Special Tool for the positive starter (tooling, $3,750; unit cost $4.25), adapter (tooling, $910; unit cost $1.28), and cocking device (with threads - tooling, $125; unit cost $.90; without threads - tooling, $60; unit cost $.23). The estimate has been forwarded to the client with a request for authorization to place the order for the movements. Verbal authorization has been received from [redacted] STAT No request was made for the other units at this time as they can be prepared in a relatively short time. (A new type can has been received from The Continental Can Company and is now undergoing surveillance testing.) The results of the timing tests on the New Haven movements have been forwarded to all concerned. Mr. Wilson's comments have been received and also forwarded.

4. Future Work: Future work includes the completion of necessary tooling for the case and movement followed by the production of 1,000 firing devices and finalization of drawings and specifications. Accelerated aging tests are to be conducted on the movement alone, completed case, accessories, and packaging. (Two Feder clocks are being examined by the Johnson Jewelry Co., and a report of the findings will be forthcoming.)

Two weeks for prototypes - 1 May

1. Has written approval gone to ADC auth. placing order for movements. No not necessary
2. What is prod. schedule?
3. What's happening re: the two prototypes which are to be inspected to make all parts are compatible?

/pdw

From [redacted] STAT

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FORM NO. 101

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Firing Device, Clockwork

CONFIDENTIAL

MEMORANDUM

To: [redacted] STAT

cc:

Case: 58214-AB Date: May 6, 1953 Page: 1
CK-15-529

Subject: Status Report

1. Object: The object of Work Order CK-15-529 is to develop a suitable clockwork firing device that will operate in the desired manner between -40°F. and 165°F.

2. Present Phase: The development of a suitable watch movement by New Haven Watch and Clock Company and the tooling for the cases by Thomaston Tool Company is the present phase.

3. Progress Since Last Meeting: Tooling will be completed within two weeks for the case by Thomaston Special Tool Company. Continental Can Company has not yet submitted their estimate on tooling costs for the special can. New Haven Watch did not complete the two models on schedule as promised. Other sources have been tentatively investigated for this project. However, this would result in a much greater tool cost. Denegre of New Haven stated no additional work on the models could be started until June 8, 1953. New Haven refused to begin tooling until the models were completed and accepted.

4. Future: A meeting with New Haven will be arranged on May 12, 1953 to firm delivery (if possible).. If unsatisfactory, we will attempt to obtain unassembled parts to be assembled by another organization. Tests will be conducted on these units. Tentative specifications and drawings will be prepared. A report will follow. No schedule can be determined at this time.

By: [redacted] STAT

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From: [redacted] STAT [redacted] STAT

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